CLAIMS

What is claimed is:

1. An address protocol for forwarding a message packet from a source node to a destination node along a sequence of communicatively coupled nodes functioning as a linear chain network, the address protocol comprising:

a relative destination address field including a counter programmed with an initial value at the source node corresponding to a destination node that is a preselected number of nodes away from the source node along the linear chain network;

wherein the counter is adjusted by a preselected step in value at each node the message packet is forwarded to along the chain network until the counter reaches a trigger value indicating that the destination node has been reached.

2. The protocol of Claim 1, further comprising an identifier field containing an identifier to identify the message packet as having a relative address protocol.

3. The protocol of Claim 2, further comprising a relative source destination field containing the initial value.

4. The protocol of Claim 1, further comprising a relative source destination field containing the initial value.

5. An address protocol for forwarding a message packet from a source node to a destination node along a sequence of communicatively coupled nodes functioning as a linear chain network, the address protocol comprising:

an identifier field containing an identifier to identify the message packet as having a relative address protocol; and

a relative destination address field including a counter programmed with an initial value at the source node corresponding to a destination node that is a preselected number of nodes away from the source node along the linear chain network;

wherein the counter is adjusted by a preselected step in value at each node the message packet is forwarded to along the linear chain network until the counter reaches a trigger value indicating that the destination node has been reached.

6. The protocol of Claim 5, further comprising a relative source address field for storing the initial value.

7. The protocol of Claim 5, wherein the initial value is an integer having an absolute value equal to the desired number of node hops and the counter is changed by a step in value of one at each node.

8. The protocol of Claim 7, wherein the counter is programmed with the initial value and the counter is counted down by one at each node hop until a trigger value of zero is reached.

9. The protocol of Claim 7, wherein the counter has an initial value of zero and the counter is counted up by one at each node hop until a trigger value equal to the initial value is reached.

10. The protocol of Claim 5, wherein the initial value is a linear function of the desired number of node hops.

11. The protocol of Claim 5, wherein at least one node in the linear chain is a regenerator element.

12. The protocol of Claim 5, wherein the chain network is a virtual chain network.

13. The protocol of Claim 5, wherein the chain network comprises a portion of a ring network.

14. A method of sending a message packet along a portion of a network function as a linear chain network from a source node to a destination node using an address protocol having an identifier to identify the message packet as having a relative address protocol, a relative source address field for storing an initial value, and a relative destination address field containing a counter, the method comprising the steps of:

selecting an initial value that is a function of a desired number of node hops along the linear chain network from the source node;

programming the counter to have the initial value;

adjusting the counter by a preselected step in value at each node that the message packet is forwarded to; and

accepting the message packet at a destination node when the counter value reaches a preselected trigger value;

wherein the preselected step in value is chosen so that the counter reaches the trigger value when the packet has completed the desired number of node hops.

15. The method of Claim 14, wherein the message packet comprises a status query message and further comprising the steps of:

requesting the destination node to send a status message packet having a second identification field and a second counter in a direction along the chain back to the source node;

programming the second counter to have the initial value;

adjusting the second counter by the preselected step in value at each node that the message packet is forwarded to; and

accepting the status message packet when the counter reaches the preselected trigger value;

whereby the status message packet is returned to the source node.

16. The method of Claim 15, wherein at least one of the nodes of the chain includes a regenerator element.

17. The method of Claim 15, further comprising the steps of: selecting a return message; programming a second counter disposed in an address protocol of the return message to have a return value having equal in magnitude of the initial value; transmitting the second message in the return direction; adjusting the second counter by the magnitude of the preselected value at each node that the message packet is forwarded to; and accepting the return message packet at the source node when the second counter reaches the preselected trigger value.

18. A method of sending a message packet along a chain network having regenerator nodes from a source node to a destination node using an address protocol having an identifier to identify the message packet as having a relative address protocol, a relative source address for storing an initial value, and a relative destination address field containing a counter, the method comprising the steps of:

selecting an initial value that is a function of a desired number of node hops along the linear chain from the source node;

programming the counter to have the initial value;

adjusting the initial value of the counter by a preselected step in value at each node that the message packet is forwarded to; and

accepting the message packet at a destination node when the counter value reaches a preselected trigger value;

wherein the preselected step in value is chosen so that the initial value reaches the trigger value when the packet has completed the desired number of node hops.

19. The method of Claim 18, wherein the message packet comprises a status query message and further comprising the steps of:

requesting the destination node to send a status message packet having a second identification field and a second counter back to the source node;

programming the second counter to have the initial value;

adjusting the second counter by the preselected step in value at each node that the message packet is forwarded to; and

accepting the message packet when the second counter reaches the preselected trigger value;

whereby the status message packet is returned to the source node.

20. The method of Claim 19, further comprising the steps of:

sending a plurality of status query messages to a plurality of destination nodes, the destination nodes having initial values corresponding to nodes that are each a different number of node hops from the source node;

receiving status messages from responding destination nodes; and

determining the relative distance of responding nodes as a function of the initial value of each responding node;

whereby a fault is isolated to a part of the network subsequent to the responding active node the greatest number of node hops from the source node.

21. A method of detecting a fault in a linear chain of regenerator nodes using a relative address protocol having an identifier for identifying a message packet as having the relative address protocol, a relative source address for storing an initial value, and a relative destination address field containing a counter, the method comprising the steps of:

sending a first status query message packet requesting a status message from a destination node at least one node hop from the source node; and

sending at least one subsequent status query message packet requesting a return status message from another destination node corresponding to a different number of node hops from the source node and recording whether the return status message is received at the source node; and

determining the node the greatest number of node hops from the source node replying to the status query message directed to it;

wherein a fault in a node is isolated to a portion of the chain network subsequent to the node the greatest number of node hops from the source node returning the corresponding status message.